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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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KARL A. LITTAU

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EXAMINER

ZERVIGON, RUDY

ART UNIT

PAPER NUMBER

1792

MAIL DATE

DELIVERY MODE

03/26/2010

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	08/893,917	LITTAU ET AL.	
	Examiner	Art Unit	
	Rudy Zervigon	1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 01 February 2010.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 22-24, 27 and 28 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 22-24, 27 and 28 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on February 1, 2010 has been entered.

Claim Rejections - 35 USC § 103

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

3. Claims 22-24 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shang; Quanyuan et al. (US 5788778 A) in view of Markunas; Robert J. et al. (US 5018479 A). Shang teaches a method (column 4, lines 23-63; column 6, lines 13-23) of removing residue from a substrate processing chamber (10; Figure 1; column 4, lines 4-15), said method (column 4, lines 23-63; column 6, lines 13-23) comprising the steps of: forming a plasma remotely (46; Figure 1; column 4, lines 40-53) with respect to said chamber (10; Figure 1; column 4, lines 4-15), said plasma including a plurality of reactive radicals; forming a flow of said reactive radicals traversing toward said chamber (10; Figure 1; column 4, lines 4-15); forming a nonplasma diluent gas flow (32,34; Figure 1; column 4, lines 23-31), mixing said flow of said reactive radicals and said diluent gas flow at a mixing location ("T" location at 33) downstream of a location (where "57" is detailed) of forming said flow of said reactive radicals and anterior to

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said chamber (10; Figure 1; column 4, lines 4-15) to form a gas-radical mixture; and flowing said gas-radical mixture into said chamber (10; Figure 1; column 4, lines 4-15) to remove residue from within said chamber, wherein each step of the method occurs without a wafer in said chamber (10; Figure 1; column 4, lines 4-15) - claim 22. Applicant's amended claim requirement is believed to be taught by Shang. According to Shang (column 1; lines 24-37), his plasma deposition system is "repeatedly" used for the implied plasma assisted deposition process (column 1; lines 5-15). As such, the deposition of a material film on a substrate, when a substrate is in the chamber (column 1; lines 20-23), *defines* Shang's "repeated use" of column 1, line 27. Shang then goes on to state that *after* Shang's "repeated use" the chamber's interior is cleaned as discussed above and below with respect to the pending claims. As a result, the Examiner believes that Shang implies the *absence* of a wafer *during cleaning*, and not during "repeated use", because the substrate must be present for Shang's process to perform as intended during the "repeated use". Further, the presence of a substrate *during* Shang's cleaning and deposition conflates such processes already distinguished by Shang (column 1; lines 24-30).

Shang further teaches:

- i. The method (column 4, lines 23-63; column 6, lines 13-23) as recited in claim 22 wherein said flow of reactive radicals and said gas flow are established to maintain a pressure within said chamber (10; Figure 1; column 4, lines 4-15) below one torr (column 5, lines 8-13), as claimed by claim 23
- ii. The method (column 4, lines 23-63; column 6, lines 13-23) as recited in claim 22 wherein said reactive radicals comprise atoms associated with a reactive gas, with said reactive

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gas being selected from a group consisting of NF_3 (column 5, lines 8-13), dilute F_2 , CF_4 , C_2F_6 , C_3F_8 , SF_6 , and ClF_3 , as claimed by claim 24

- iii. The method (column 4, lines 23-63; column 6, lines 13-23) as recited in claim 22 wherein said chamber (10; Figure 1; column 4, lines 4-15) has components therein, with a subset of said radicals in said gas-radical mixture reacting with said components creating a residue (column 6, lines 13-23) and further including the step of exhausting said residue, with a rate at which said residue is exhausted depending upon a rate of said diluent gas flow, as claimed by claim 27. When the structure recited in the reference is substantially identical to that of the claims, claimed properties or functions are presumed to be inherent (In re Best, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977); MPEP 2112.01).

Shang is not specific in teaching that the nonplasma diluent gas flow comprises at least one of an inert gas or a reduction gas (hydrogen as reducing gas; column 5, lines 1-5), “as a gas used during deposition” (column 4, lines 21-22) – claim 22.

Markunas teaches a similar remote plasma apparatus (Figure 2; column 6; lines 8-48) including a plasma feed (14; Figure 2; column 6; lines 8-48) and a hydrogen “carrier gas”, as reducing gas, nonplasma (18₁ - “carrier gas feed” Figure 2; column 6; lines 8-48) feed.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to add hydrogen to Shang's “nonplasma” diluent gas feed as taught by Markunas.

Motivation to add hydrogen to Shang's “nonplasma” diluent gas feed as taught by Markunas is for “moderating the gas phase chemistry” as taught by Markunas (column 8, lines 45-50).

4. Claim 28 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shang; Quanyuan et al. (US 5788778 A) and Markunas; Robert J. et al. (US 5018479 A). Shang and Markunas are

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discussed above. Shang further teaches “user-selected flow rates” (column 4, lines 53-63). Shang and Markunas do not teach the method (column 4, lines 23-63; column 6, lines 13-23; column 6, lines 32-39) as recited in claim 22 wherein said diluent gas flow travels at a first rate and said flow of said reactive radicals travel at a second rate with a ratio of said first rate to said second rate being at least 2:1, as claimed by claim 28.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to optimize the relative flow rates of Shang’s gas sources.

Motivation to optimize the relative flow rates of Shang’s gas sources is for “achieve optimum of performance for a particular system” as taught by Shang (column 6, lines 32-39). It would be obvious to those of ordinary skill in the art to optimize the operation of the claimed invention (In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980); In re Hoeschele, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969); Merck & Co. Inc. v. Biocraft Laboratories Inc., 874 F.2d 804, 10 USPQ2d 1843 (Fed. Cir.), cert. denied, 493 U.S. 975 (1989); In re Kulling, 897 F.2d 1147, 14 USPQ2d 1056 (Fed. Cir. 1990), MPEP 2144.05).

Response to Arguments

5. Applicant's arguments filed February 1, 2010 have been fully considered but they are not persuasive.

6. Applicant states:

“

The two references cited in the final office action are Shang and Markunas. While Shang discloses both deposition and cleaning processes, Markunas only grows epitaxial semiconductor layers. Because Markunas grows a substrate, it is necessary that the substrate is be found within

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the chamber. The claimed invention, on the other hand, requires that each step occur without a substrate within a chamber. And the claimed method is explicit in that the gas-radical mixture is flowed in order to remove residue from within the chamber. Markunas is in complete opposition with the claimed subject matter.

“

7. In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). In response, the Examiner's above new grounds of rejection strictly rely on the teachings of Shang; Quanyuan et al. (US 5788778 A) *exclusively*. Shang, as noted by Applicant, teaches plasma assisted deposition process staggered by cleaning processes. Shang's plasma assisted deposition process all require a substrate to be present and for Shang's deposition process to function as intended. However, as the Examiner discusses above, the deposition of a material film on a substrate, when a substrate is in the chamber (column 1; lines 20-23), *defines* Shang's "repeated use" of column 1, line 27. Shang then goes on to state that *after* Shang's "repeated use" the chamber's interior is cleaned as discussed above and below with respect to the pending claims. As a result, the Examiner believes that Shang implies the *absence* of a wafer *during cleaning* , and not during "repeated use", because the substrate must be present for Shang's process to perform as intended during the "repeated use". Shang either performs a plasma assisted deposition process OR a cleaning process. Shang's cited discussion implies the presence of a substrate in ONE of the processes, Namely, deposition.

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8. Applicant states:

“

Moreover, even if these references can be combined, does not render the resultant combination is obvious. To be obvious, the results must be predictable.⁴ Here, a person having ordinary skill in the art would not predict that the addition of steps from a substrate growing process could be used with a residue removal process. The two processes are simply too different. Because the two processes work in opposition with each other, such a person would believe just the opposite. Hence, combining Shang with Markunas would not lead to predictable results.

“

In response, the Examiner agrees with Applicant that the two processes are different, however, Shang has clearly demonstrated that a cleaning process improves subsequent deposition processes – column 1; lines 24-37.

Conclusion

9. This is a continued examination of applicant's earlier Application No. 08893917. All claims are drawn to the same invention claimed in the earlier application and could have been finally rejected on the grounds and art of record in the next Office action if they had been entered in the earlier application. Accordingly, **THIS ACTION IS MADE FINAL** even though it is a first action in this case. See MPEP § 706.07(b). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after

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the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no, however, event will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Rudy Zervigon whose telephone number is (571) 272-1442. The examiner can normally be reached on a Monday through Thursday schedule from 8am through 6pm EST. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300. Any Inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Chemical and Materials Engineering art unit receptionist at (571) 272-1700. If the examiner can not be reached please contact the examiner's supervisor, Parviz Hassanzadeh, at (571) 272- 1435.

/Rudy Zervigon/

Primary Examiner, Art Unit 1792